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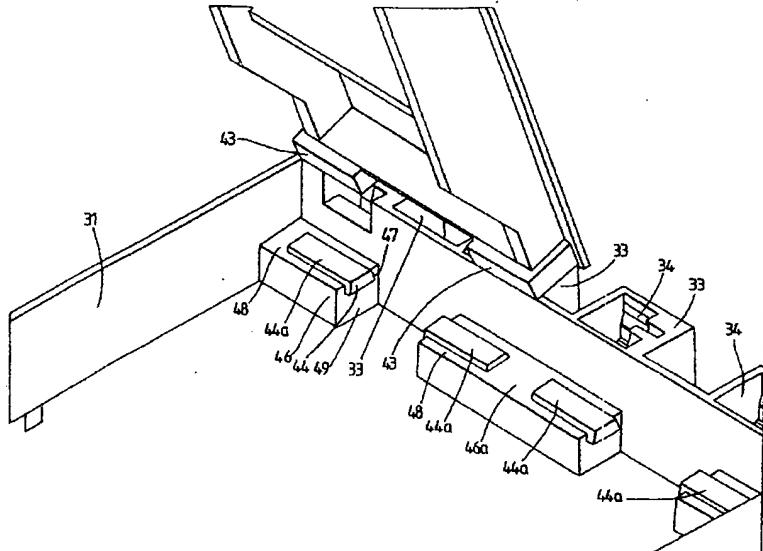
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(54) Title: A FRAME FOR A RECESS IN THE GROUND AND MANHOLE ASSEMBLY



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(57) Abstract: A frame (10) for bounding the open end of a recess includes an upstanding, peripheral wall (11) having protruding outwardly therefrom a flange (12). The frame (10) includes, within the peripheral wall (11) plural seatings (13, 14, 16, 17) for a cover (18) that is insertable into the frame (10). Each seating (13, 14, 16, 17) includes a seating member (21) having secured thereto a resiliently deformable pad (19) part (19a) of which protrudes beyond the seating member (21) to provide a resiliently deformable seating that is engageable by part of the cover (18).

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A FRAME FOR A RECESS IN THE GROUND AND MANHOLE ASSEMBLY

This invention relates a frame for bounding a recess and related assemblies.

- 5 In particular the invention concerns a frame for bounding the open, upper edge of a downwardly extending recess formed in the ground or a ground-like floor.

Examples of such frames include frames for manhole covers, drains and

- 10 gully grates. The invention concerns but is not limited to all such frames.

It has for a long time been known to provide a manhole or similar frame including a peripheral, upstanding wall having protruding outwardly from a lower part thereof a flange for anchoring the frame in a bedding medium

- 15 such as mortar or other materials.

Such a frame is intended to be installed at the top of eg. a drain, sewer, inspection chamber or similar recess that extends downwardly from a surface such as the ground or a ground-like floor. The frame defines a

- 20 boundary at the open, upper limit of the recess.

Within, and below the upper edge of, the upstanding wall are formed, secured to the frame, seatings for one or more cover members.

- 25 In the specific case of a manhole frame, the cover members typically are heavy, substantially imperforate plates that close off the aperture bounded by the frame.

- In other applications such as gully grates and drains the covers define a
30 grating by means of being perforated in multiple locations. Consequently such covers serve to permit the passage of eg. rainwater into the recess,

while simultaneously preventing the passage of leaves, stones and other debris entrained therewith.

Regardless of the precise nature of the cover plates, it is well known to
5 provide three seatings secured to the upstanding wall in a triangular pattern.
The seatings typically present essentially upwardly facing surfaces, which
may be flat or (in some known arrangements) shaped for co-operation with
downwardly facing surfaces of limbs or other features formed in the
underside of a cover plate of the kind described hereinabove.

10

The use of three seatings in a triangular pattern renders the cover "non-rocking", since an article supported at three points that are spaced to define a triangle is inherently stable without any need for specific levelling measures.

15

A further advantage of using seatings defining a triangular pattern is that in the case of a frame that is a parallelogram and more specifically rectangular when viewed in plan, the triangular pattern of seatings conveniently lends itself to the use of pairs of triangular cover plates that abut one another
20 along adjacent edges to occupy the aperture bounded by the frame in an efficient manner.

Employing this principle, a square aperture may conveniently be closed by a pair of cover plates that are each right angled triangles supported on
25 seatings at their apexes and abutting one another along their hypotenuses.

A rectangular aperture may similarly be closed by two pairs of such covers each supported in a non-rocking fashion at their apexes by seatings defining a series of triangular patterns.

30

It is also known to support square and circular covers in frames as described

herein, again through the use of triangular patterns of seatings in order to define non-rocking supports.

Although non-rocking frame and cover combinations as described
5 hereinabove have been widely installed, they nonetheless suffer disadvantages as follows:

- Non-rocking covers do not remain non-rocking indefinitely. In areas of heavy usage (for example roadways over which many vehicles
10 drive, causing repeated impulses to impinge on the covers), the seatings for the covers and the covers themselves tend to wear. This can bring further points of the cover into contact with the frame. This potentially produces a rocking arrangement that can be undesirably noisy.
15
- As discussed in FR-A-2 797 647 there are disadvantages associated with using three cover seatings arranged in a triangular pattern, when the cover itself is not triangular but is eg. rectangular or circular. This is because forces acting on the cover at locations that define a moment arm relative to one or other of the seatings can cause distortion, wear and other failures of the cover and frame combination, whereby the covers become noisy and/or dangerous in use.
20
- FR-A-2 797 647 proposes a solution to this problem, of providing resiliently deformable pads on the undersides of the covers in locations thereof that lie spaced from the seatings. However, this solution is complicated to manufacture and install. Furthermore the resiliently deformable pads wear out considerably faster than the covers to which they are secured. This in turn means that the covers may be mistakenly discarded and replaced, on the basis of the
25
30

resiliently deformable members having worn out, before the covers have in fact reached their service lives.

- 5 ◦ The frames sometimes move, under heavy usage, relative to the bonding medium by which they are secured at the top of a recess. Such movement results in tilting of a frame such that the covers can sit askew on the seatings and become susceptible to rocking. If the frame sinks the covers may become caught on projections in the top of the aperture, causing them to rock noisily when impacted.

10

- 15 • It is known to hinge covers to frames, especially in the case of manholes. Since the frames and the covers commonly are made of cast iron and the covers usually are very heavy, hinging of the covers to the frames lessens the mass that service personnel must lift in order to open each cover and gain access to the recess beneath.

20 EP-A-0 808 951 discloses a hinging arrangement of such covers that are formed as triangles occupying a rectangular frame. The hinges of the triangular covers are arranged on adjacent sides of the frame, so that even in the case of a four cover, rectangular manhole it is possible to have free access to the recess via at least one of the sides thereof.

25 However this arrangement is in fact sub-optimal for the needs of personnel accessing underground services such as in the telecommunications or utility industries. For example, the telecommunications industry requires sufficient access to cable ducts and inspection chambers for the purpose of inserting eg. cable-blown equipment, maintenance equipment and long lengths of cable therein. Overall there is a need for an improvement in the accessibility of manhole frame and cover combinations for use with

underground services.

- According to a first aspect of the invention there is provided a frame for bounding the open, upper end of a downwardly extending recess formed in
- 5 a floor or the ground, the frame comprising an upstanding, peripheral wall having protruding outwardly therefrom a flange that is embeddable in a medium so as to retain the frame relative to a said recess; and the frame including secured thereto within the peripheral wall one or more seatings for a cover that is insertable into the frame with the peripheral wall
- 10 surrounding at least part of the cover, the or each seating including a seating member having secured thereto a resiliently deformable and removable pad at least a part of which protrudes from the seating member to provide a resiliently deformable seating surface that is engageable by a part of a said cover.
- 15
- According to a second aspect of the invention there is provided a manhole assembly comprising a frame for bounding the open, upper end of a downwardly extending recess formed in a floor or the ground, the frame comprising an upstanding, peripheral wall having protruding outwardly
- 20 therefrom a flange that is embeddable in a medium so as to retain the frame relative to a said recess; and the frame including secured thereto within the peripheral wall one or more seatings for at least one cover that is insertable into the frame with the peripheral wall surrounding at least part of the cover; one or more covers that are insertable into and removable from the
- 25 frame; and at least four resiliently deformable pads each interconnecting a said cover and a said seating when the or each cover is inserted in the frame, the resiliently deformable pads lying at the corners of a quadrilateral thereby defined on the in-use underside of the one or more covers.
- 30 Regardless of whether the invention is embodied as a frame or as a manhole assembly the or each resiliently deformable pad preferably is releasably

securable in a said seating member.

For convenience the term "manhole assembly" is used herein to signify both an assembly in which the or each cover is imperforate (ie. a conventional manhole assembly); and an arrangement in which one or more cover is perforated (eg. as in a gully grate or drain). The term "manhole assembly" as used herein is not limited solely to arrangements bounding recesses that are sized for human access. The term embraces within its scope both larger and smaller assemblies.

10

The use of a resiliently deformable pad secured to the frame avoids the problem, that is evident in the prior art, of manhole covers that have resiliently deformable members secured thereto being discarded before they have reached their effective service lives.

15

Furthermore the optional securing of the resiliently deformable pads in seatings formed in the frame allows the replacement of the covers, which tend to wear out more rapidly than the frames, in an economical manner.

20

Preferably the upstanding wall is rectangular when viewed in plan and the frame includes a said seating in at least two corners of the thus-defined rectangle.

25

An arrangement having two of the seatings in corners of a rectangular frame is advantageously suited to manhole covers used in accessing underground services.

Conveniently the rectangular frame may include a said seating in each of the four corners of the rectangle.

30

This arrangement is suitable for manholes, drains and gullies including one

or more covers that are not hingedly secured to the frame.

In an alternative arrangement the upstanding wall of the frame is rectangular when viewed in plan and the frame includes at least one said seating part-way along at least one side of the thus-defined rectangle. This arrangement is particularly suitable for frames that require more than one cover to close their apertures.

- 5 Regardless of the precise arrangement of the seatings in the frame, preferably the or each seating member includes a cuboidal block of material defining an in-use upwardly facing shoulder and having formed therein a mortise that defines a slot that is open on the upwardly facing shoulder and on a further face of the cuboidal block.
- 10 15 This arrangement offers an advantageously simple way of retaining the resiliently deformable pad relative to the seating member, whilst allowing a part of the resiliently deformable pad to protrude from the cuboidal block defining part of the seating member.
- 20 25 More preferably the mortise defines a base that in use of the frame lies beneath the shoulder, the mortise tapering in width between the base and its opening on the shoulder; the resiliently deformable pad including an engaging portion of generally complementary cross section to that of the mortise; and the pad being restrained against movement relative to the mortise in the in-use vertical direction by engagement of the engaging portion in the mortise.

The foregoing features render the design of the resiliently deformable pad advantageously simple and easy to insert into the cuboidal block without need for mechanical assistance.

In particularly preferred embodiments the pad includes a region of material that is secured to the engaging portion and protrudes from the seating member via the opening in the shoulder.

- 5 This is a particularly efficient way of providing a portion of the pad that protrudes beyond the cuboidal block to provide a seating face against which a part of the cover may rest.

- 10 Conveniently the opening in the further face of the cuboidal block is of a shape and orientation that permits insertion of the pad into the slot and its removal therefrom, in a direction other than the in-use vertical direction.

- 15 This feature allows for ready assembly of the pads into the cuboidal blocks, without detracting from the action of the mortise in restraining the pads against vertical movement.

- 20 The nature of the opening on the further face of the cuboidal block also advantageously allows replacement of the pads. Thus the pads may provide replaceable wearing surfaces of the frames, thereby effectively prolonging the overall life of the frames compared with prior art frames.

In a preferred embodiment the upwardly facing shoulder is in use of the frame inclined to define respective upper and lower shoulder edges.

- 25 It is also preferable that the frame includes a pair of the seating members that are spaced from one another in the in-use horizontal direction and the upwardly facing shoulders of which are mirror images of one another whereby the upper shoulder edges define the furthest spaced apart regions of the pair of seating members.

30

It follows from this that when a cover is lain on the frame such that

engaging limbs of the cover engage the respective seatings of the pair, the opposed, inclined nature of the shoulders of the pair of seatings tends to cause the frame to centre itself between the seatings.

- 5 The invention is also considered to reside in a frame having one or more covers resting thereon.

For the avoidance of doubt, as stated herein, "cover" includes but is not limited to solid covers (such as manhole covers); drains; and gully grates.

10

- Preferably the frame and each cover include co-operating connections and particularly hinge parts formed respectively on a side of the cover and a side (eg. a first edge) of the frame whereby the or each cover is hingedly secured to the frame at the first side thereof; the or each cover substantially spanning the frame from the first side to a second side (eg. a second edge) opposite the first side.

In an arrangement as aforesaid in which the or each cover is hingedly secured to the frame, the frame is in preferred embodiment rectangular.

- 20 However, other shapes are possible as described hereinbelow.

Conveniently the second side has secured thereat a pair of the seatings that are engageable by the underside of each of the covers.

- 25 Even more preferably the frame is essentially rectangular and includes a plurality of the covers arranged side by side, all of the covers being hinged on the same side of the frame whereby the covers are openable to leave free access to the recess on all the remaining sides of the frame.

- 30 The foregoing arrangements provide particular advantages when the frame is a manhole frame used in the telecommunications industry. Indeed the

arrangement of the invention permits for the first time the provision of a rectangular frame the covers of which hinge along only one edge of the rectangle thereby leaving three clear sides via which operators may gain access the recess beneath the frame.

5

More particularly, in preferred embodiments of the invention the upstanding wall is rectangular when viewed in plan; and each cover is rectangular, the major axis of each said cover lying perpendicular to the major axis of the rectangle defined by the upstanding wall; and the edges of adjacent said 10 covers lying spaced from one another such that the covers are capable of overlying substantially the entire aperture defined by the recess.

This permits the provision of a rectangular manhole frame whose covers are a series of parallel, elongate, rectangular leaves that span from one side of 15 the frame to the other, lying parallel to the minor axis of the rectangular frame.

In one embodiment of the invention each of the covers is substantially imperforate, whereby the frame and cover combination defines a manhole.

20

In an alternative arrangement one or more of the covers is perforated to define a grating, grille or drain.

The width of the flange of the frame may preferably vary from place to 25 place about the periphery of the frame. This allows an efficient use of the material of the frame by providing wider flange portions in regions where there is a particular need for the flange to bond the frame to the medium; and narrower flange portions at other locations where there is a lesser bonding requirement.

30

Preferably the frame includes protrusions or recesses formed on one or

more surfaces thereof that are embeddable in a bonding medium at the open, upper end of the recess, the protrusions or recesses enhancing the bonding of the frame in the medium and stiffening the frame.

- 5 Such protrusions or recesses enhance the bonding of the frame in the bonding medium; and also improve the strength, and hence the service life, of the frame.

Conveniently the protrusions or recesses include an array of ribs formed on
10 an upwardly and/or downwardly facing surface of the flange. Moreover the ribs of the array preferably are elongate and are mutually parallel, and all protrude by generally the same amount from the flange.

Even more preferably the frame is generally polygonal when viewed in
15 plan; and the elongate axis of each rib is generally parallel with a diagonal of the thus-defined polygon.

The foregoing features of the bonding and stiffening ribs have been found to be particularly effective in conferring good performance on the frames.

20 In addition to the advantages set out hereinabove of the arrangements of the invention, the following desirable aspects inure to the use of the resiliently deformable pads:

- 25 • There is a much reduced chance of the covers and frames becoming noisy in use, since the pads serve to isolate the components thereof from one another.
- The resilience of the deformable pads may be chosen to mimic that of the bonding medium and/or surrounding ground in which the frame is installed. This reduces the likelihood of impulses

transmitted to the frame (eg. from passing vehicles) causing shifting of the frame relative to the bonding medium.

- 5 o The arrangement of the invention is considerably simpler than that proposed in FR-A-2 797 647.

There now follows a description of preferred embodiments of the invention, by way of non-limiting example, with reference being made the accompanying drawings in which:

10 Figure 1 is a plan view from above of a manhole frame according to the invention, including in phantom a manhole cover that is receivable therein;

Figure 2 is a cross-sectional view on arrows A-A of Figure 1, including parts of the cover;

15 Figure 3 is a cross-sectional view on line B-B on Figure 1, including parts of the cover;

Figure 4 is a horizontally sectioned view on lines C-C of Figure 3 showing a resiliently deformable pad;

Figure 5 is a vertically sectioned view on line D-D of Figure 1;

20 Figure 6 is a vertically sectioned view on line E-E of Figure 1;

Figures 7A and 7B are, respectively, plan and elevational views of one form of resiliently deformable pad that is useable in frames according to the invention;

25 Figure 8 is a perspective view of one corner of the frame of Figure 1, omitting the cover therefrom for clarity;

Figure 9 is a perspective view of a second embodiment of frame according to the invention, having hingedly secured thereto a plurality of manhole covers;

30 Figure 10 is an enlarged, perspective view of the Figure 9 arrangement that omits one of the covers, for clarity; and

Figure 11 is a perspective view from underneath of part of the

Figure 9 arrangement.

Referring to the drawings a frame 10 for bounding the open, upper end of a downwardly extending recess (such as but not limited to a duct, manhole, 5 inspection chamber, fire hydrant chamber, water main or similar installation) formed in a floor or the ground includes an upstanding, peripheral wall 11 having protruding outwardly therefrom a flange 12 that is embeddable in a medium (not shown) so as retain the frame relative to a recess as aforesaid.

10

In the Figure 1 embodiment peripheral wall 11 is essentially rectangular, having straight, upstanding pairs of mutually parallel walls and four rounded corners 11a. The corners 11a are rounded primarily because the frame 10 is cast from a material such as iron. As is well known, it is more 15 reliable to cast such items with radiused, rather than sharp, corners.

In fact, the entire frame 10 is essentially rectangular when viewed in plan.

Flange 12 protrudes from the base of upstanding wall 11 and extends about 20 the entire, rectangular periphery of the frame 10.

Frame 10 includes secured thereto within the peripheral wall 11 four seatings 13, 14, 16 and 17.

25 In the embodiment of Figure 1, there is a seating secured at each corner 11a of the peripheral wall 11. Each seating lies within the peripheral wall and, as shown in Figure 2 which illustrates in vertically sectioned view a part of the seating 13 visible in Figure 1, extends part-way up the height of wall 11 from the lowermost part thereof.

30

The seatings 13, 14, 16, 17 are intended to be engageable by a cover 18 that

as shown in Figure 1 is an outer periphery of complementary shape to the inner side 11b of wall 11.

The shape and size of cover 18 are therefore such that cover 18 is insertable
5 into the frame with the peripheral wall 11 surrounding the cover 18.

The cover may be entirely removable from the frame as in the case of traditional manhole covers and removably secured thereto. Alternatively the preferred embodiment described herein refers to a cover pivotally
10 connected to a frame, particularly by way of a hinged connection.

As best shown in Figure 2, each seating as exemplified by seating 13 includes a seating member 21 having secured thereto a resiliently deformable pad 19 a part of which protrudes from the seating member 21 to provide a resiliently deformable seating that is engageable by a limb 22 protruding downwardly from the underside of the cover 18 at the edge thereof adjacent the seating.
15

The part 19a of the pad 19 that protrudes above the seating member 21 is best viewed in Figure 3, that is a vertically sectioned view of the seating 30 taken on arrows B-B of Figure 1 ie. so that the section line does not pass through the pad 19. Thus Figure 3 shows the part 19a of pad 19 protruding above the upper edge of seating member 21.
20

25 Pad 19 preferably is manufactured from a material known as "Railpad".

The seating member 21 is a cuboidal block of material that, in the embodiment shown, is cast integrally with the remainder of the frame 10. In other embodiments the block constituting seating member 21 may be
30 manufactured separately from the frame 10 and subsequently secured thereto eg. by bolting, pinning, doweling or welding. Nonetheless integral

casting of the block 21 is the preferred embodiment not least because of the efficiency of manufacturing process represented thereby.

Seating member 21 defines an in-use upwardly facing shoulder 23 having
5 formed therein a mortise 24 defining a slot that is open on shoulder 23 as represented by numeral 26 in Figures 1 to 8 and also open on a further face 27 of seating member 21 as exemplified by reference numeral 28.

The components 26, 27 and 28 are best seen in Figure 8.

10

Also as best seen in Figure 8, the mortise 24 is essentially of the "dovetail" type, so that it defines a base 29 that in use of the frame (ie. when the frame is horizontally disposed as shown) lies beneath shoulder 23.

15 The mortise 24 tapers in width between the base and its opening as indicated by numeral 26.

Pad 19 includes an engaging portion 19b that is of generally complementary cross section to that of the mortise 24. Consequently pad 19 is restrained
20 against the mortise 24 in the in-use vertical direction, by engagement of the tapering sides of the engagement portion 19 with the tapering sides of the mortise 24.

25 Protruding region 19a of pad 19 is in the embodiment shown simply a continuation of the taper thereof in the in-use vertical direction, whereby protruding portion 19a is sufficiently narrow to fit through and protrude above the slot 26 formed in shoulder 23.

Other shapes, sizes and configurations of the engaging portion 19a are of
30 course possible within the scope of the invention. For example portion 19a may include a series of protrusions (as opposed to a single protrusion).

Furthermore engaging portion 19a need not have tapering sides as shown in the drawings.

- The opening 28 in further face 27 of the cuboidal block defining the seating member 21 is of the same vertical cross section as the remainder of the mortise 24, whereby the pad 19 is slidable into and out of the mortise 24 during manufacturing and/or maintenance operations carried out on the frame 10.
- 10 The orientation of the taper and the other features of the mortise 24 are such that the sliding of the pad 19 into and out of the mortise 24 occurs essentially in a horizontal direction. Consequently the direction of insertion and removal of the pad 19 differs from the vertical direction of movement thereof that is restrained by the taper of the mortise 24. The pad 19 is received in the mortise 24 by manually sliding it into the mortise and creating an interference fit therein. No tools or other mechanical assistance are necessary to insert the pad.
- 15

- As best seen in Figures 2 and 8, shoulder 23 inclines downwardly from an upper edge 23a that lies adjacent upstanding wall 11; to a lower edge 23b spaced therefrom.

- 20 The seating 17 disposed at the opposite end of frame 10 to that of seating 13 includes the seating member and a pad 19 that are mirror images of their counterparts constituting seating 13.

- 25 The seating 16 that is located at the diametrically opposite corner of frame 10 to seating 13 is essentially identical to seating 13 but rotated through 180°. The seating 14 that lies at the diametrically opposite corner of frame 10 to seating 17 is essentially the same as seating 17 but rotated through 180°.

Consequently the seatings 13, 14, 16, 17 define pairs of inclined shoulders having pads protruding therefrom. The directions in which the shoulders incline tend to cause the cover seating to centre itself in the frame 10, within 5 the wall 11, when the cover 18 is inserted thereinto.

- Although in the embodiment shown the shoulders 23 incline downwardly towards one another, it is within the scope of the invention to define other arrangements of the shoulders 23 that cause self-centring of a cover such as 10 cover 18 inserted into the frame 10. For example, the respective members of each pair of seatings 13, 17 and 14, 16 could incline upwardly towards the centre of the associated part of peripheral wall 11, instead of downwardly as shown.
- 15 Since the pads 19 are manually removable from the seating member 21 they can be replaced by new pads once worn without having to replace any other part of the frame.

Referring now to Figures 9 to 11 there is shown a second embodiment of 20 frame 30 according to the invention.

Frame 30 is generally rectangular when viewed in plan and has an upstanding peripheral wall 31 that is also generally rectangular when viewed in plan. An outwardly extending flange 32 extends about the outer 25 periphery of wall 31, from the lowermost part thereof. The function of flange 32 is similar to the function of flange 12 in the Figure 1 embodiment.

Along one side 31a upstanding wall 31 has formed therein a series of eight hinge blocks 33 arranged at equally spaced intervals. Each hinge block is 30 cast integrally with the iron of the remainder of frame 30 and has an upper wall that terminates flush with the upper edge of wall portion 31a.

An aperture 34 opens on the upper surface of each hinge block 33 for receiving hinge parts in a manner described below.

- 5 A series of four rectangular, elongate covers 36, 37, 38, 39 are hingedly secured to wall portion 31a by virtue of hinge parts protruding from a rear edge of each of them in the respective apertures 34.

- 10 Each of the covers 36 has protruding from its rear edge as viewed in Figure 9 a pair of hinge parts, whereby each pair of hinge blocks 33 functions hingedly to secure to the frame 30 a respective cover 36, 37, 38, 39.

Each cover 36, 37, 38, 39 spans the frame 30 from first side thereof defined by wall portion 31a, to a second side opposite wall portion 31a.

- 15 As illustrated by the partially open condition of cover 36 in Figure 9, the hinging arrangement is such that all four of the covers 36, 37, 38, 39 hinge on a single side (31a) of the upstanding wall 31. Therefore when the covers all occupy their open positions three sides of the rectangle defined by the
20 frame 30 are left clear and unobstructed.

- In the embodiment shown in Figures 9 to 11 the major axis of each cover 36, 37, 38, 39 lies perpendicular to the major axis of the rectangle defined by the upstanding wall 31. The edges of the adjacent covers are, when
25 closed, spaced from one another such that the covers are capable of overlying substantially the entire aperture defined by the recess thereby substantially to seal it.

- Other arrangements of the covers are possible. For example rectangular
30 covers having their elongate axes parallel to the elongate, major axis of the rectangle defined by the wall 31 are possible within the scope of the

invention.

- Another arrangement is one in which a circular upstanding wall 31 is closeable by a series of cover leaf segments that are hinged along a common arc located toward one side of the circle defined by the wall 31. In this arrangement there may be multiple rectangular covers or a single circular cover.
- 5

- The detachable nature of the covers relative to the frame is such that if they become worn one or more covers may be replaced without having to remove or replace the frame.
- 10

In the preferred embodiment shown in Figures 9 to 11 the underside of each cover 36, 37, 38, 39 is defined in part by a pair of parallel side rails 41, 42.

15

Each side rail 41, 42 is at its thickest mid-way along the cover 36. At either end the depth of each side rail 41, 42 is reduced to lie generally flush with an adjacent limb 43 whose function is to engage a pad 44 that is similar to the pads 19 of the Figure 1 embodiment.

20

Each limb 43 presents a downwardly facing shoulder that when the associated cover 36 to 39 is hinged to its closed position engages the upper protruding part 44a of a said pad 44.

- 25
- Each of the pads 44 is received in a seating member 46 that is similar to the seating member exemplified by reference numeral 21 in Figure 1. Thus each seating member 46 includes a mortise 47 whose shape is as described in relation to mortise 24 of Figure 1.
- 30
- The cross sectional shape and dimensions of each pad 44 are similar to the counterpart pads 19 shown in Figure 1, whereby the portions 44a protrude a

short distance above the upwardly facing shoulder 48 defining the upper surface of each seating member 46.

Since the location of each cover 36 to 39 relative to the upstanding wall 31
5 is limited in part by the engagement of the hinge parts at the rear edge thereof with the hinge blocks 33, there is a lesser need than in the case of the Figure 1 embodiment for the seating members 46 to centre the covers relative to the upstanding wall. Therefore the inclined shoulder features of Figure 1 need not be present in the Figure 9 to 11 embodiments. In all other
10 respects, however, the pads 44a and the shoulders 48 are similar to the pads 19 and shoulders 23 of the Figure 1 embodiment.

The arrangement of Figures 9 to 11 includes pads 44 located mid-way along each major side wall of the rectangle defined by wall 31. The purpose of
15 such positioning of the pads 44 is of course to provide for a pad 44 at each corner of each rectangular cover 36 to 39.

In consequence of this arrangement, the pads 44 that are located away from the corners of the upstanding wall 31 are received in "siamesed" seating
20 members 46a as best shown in Figure 10. The seating members 46a are each essentially a pair of the seating members 46 formed integrally with one another in a "back to back" fashion.

Consequently the openings of the mortises 47 in the further faces of the
25 seating members are in the case of the seating members 46a at opposite ends thereof, in order to permit ready insertion and removal of the pads 44.

Figure 11 shows the pads 44 as viewed from the underside of the frame 30.
As is evident therefrom, the pads protrude a short distance beyond the end
30 of the seating members 46 in order to provide a protrusion on the further face 49 of each seating member, whereby the pads can be gripped to assist

their insertion and removal relative to the associated mortise 47.

Although the Figure 9 embodiment of the invention is shown including four rectangular covers, the number of the covers may of course be varied within 5 the scope of the invention. Virtually any number of the rectangular covers of the kind shown in Figures 9 to 11 may be hingeably secured to a frame 30. In particular, one-cover, two-cover, three-cover and four-cover versions of the invention fall within the scope of the invention as claimed.

10 The frame itself may be modular, its size and shape being variable by adding or removing frame sections before embedding in the ground to accommodate any number and size of covers.

15 The pads 44 visible in Figures 9 to 11 are of essentially the same dimensions and shapes as those shown in Figures 7A and 7B. Furthermore the materials from which the pads are formed are the same as those of the pads 19 in the Figure 1 embodiment.

20 Preferably the covers 36 to 39 are cast from iron. However, other cover constructions are possible within the scope of the invention.

Each aperture 34 in a hinge block 33 defines a series of components that are engageable by hinge pins protruding from ears that in turn protrude from the rear edge of each cover 36 to 39.

25

A further feature of the frames 10, 30 of the invention is evident from Figure 1 which shows that the width of the flange 12 thereof is variable from place to place about the periphery of the frame. This feature allows the saving of material in regions of the flange where its gripping effect is 30 minimal.

Typically the flange is at its widest at the corners of the frame 10, when the latter is rectangular.

Also Figure 8 shows a series of protrusions and recesses 51, 52 formed in
5 the upper surface of each corner of the flange 12.

The protrusions and recesses may be present at any surface of the frame that
is embeddable in a bonding medium for the purposes of securing the frame
relative to an aperture; but the preferred location for them is on the upper
10 and/or the lower surface of the flange 12 as shown.

The protrusions and recesses 51, 52 in practice define an array of ribs that
are elongate and mutually parallel and that all each protrude by generally
the same amount from the flange 12.

15

The elongate axis of each rib 51 is generally parallel with a diagonal of the
rectangle defined by the upstanding wall 12 of the frame 10.

The features of the variability of the width of the flange; and of the
20 protrusions and recesses may equally well be employed in embodiments of
the invention such as that shown in Figures 9 to 11, as in the Figures 1 to 8
embodiment.

In another embodiment of the invention a pattern of four resiliently
25 deformable pads may be secured to the underside of each of one or more
covers of a manhole assembly, so as to engage surfaces secured on the
frame in locations that are juxtaposed relative to the pads when the relevant
cover is closed. This arrangement confers the advantages of using
resiliently deformable pads whilst providing the pads in a component other
30 than part of the frame.

CLAIMS

1. A frame for bounding the open, upper end of a downwardly extending recess formed in a floor or the ground, the frame comprising an upstanding, peripheral wall having protruding outwardly therefrom a flange that is embeddable in a medium so as to retain the frame relative to a said recess; and the frame including secured thereto within the peripheral wall one or more seatings for at least one cover that is insertable into the frame with the peripheral wall surrounding at least part of the cover, the or each seating including a seating member having secured thereto a resiliently deformable pad at least a part of which protrudes from the seating member to provide a resiliently deformable seating surface that is engageable by a part of a said cover.
- 15 2. A manhole assembly comprising a frame for bounding the open, upper end of a downwardly extending recess formed in a floor or the ground, the frame comprising an upstanding, peripheral wall having protruding outwardly therefrom a flange that is embeddable in a medium so as to retain the frame relative to a said recess; and the frame including secured thereto within the peripheral wall one or more seatings for at least one cover that is insertable into the frame with the peripheral wall surrounding at least part of the cover; one or more covers that are insertable into and removable from the frame; and at least four resiliently deformable pads each interconnecting a said cover and a said seating when the or each cover is inserted in the frame, the resiliently deformable pads lying at the corners of a quadrilateral thereby defined on the in-use underside of the one or more covers.
- 30 3. A frame according to Claim 1 or a manhole assembly according to Claim 2 wherein the or each resiliently deformable pad is releasably securable in a seating member.

4. A frame according to Claim 1 or any preceding claim depending therefrom; or a manhole assembly according to Claim 2 or any preceding claim depending therefrom wherein the upstanding wall is rectangular
5 when viewed in plan, the frame including a said seating in at least two corners of the thus-defined rectangle.

5. A frame or a manhole assembly according to Claim 3 including a said seating in all four corners of the rectangle.

10

6. A frame according to Claim 1 or any preceding claim depending therefrom; or a manhole assembly according to Claim 2 or any preceding claim depending therefrom wherein the upstanding wall is rectangular when viewed in plan, the frame including at least one said seating part-way
15 along at least one side of the thus-defined rectangle.

7. A frame according to Claim 1 or any preceding claim depending therefrom; or a manhole assembly according to Claim 2 or any preceding claim depending therefrom wherein the or each seating includes a seating
20 member having a cuboidal block of material defining an in-use upwardly facing shoulder and having formed therein a mortise that defines a slot that is open on the upwardly facing shoulder and on a further face of the cuboidal block.

25 8. A frame or a manhole assembly according to Claim 7 wherein the mortise defines a base that in use of the frame lies beneath the shoulder, the mortise tapering in width between the base and its opening on the shoulder, the resiliently deformable pad including an engaging portion of generally complementary cross section to that of the mortise, the pad being restrained
30 against movement relative to the mortise in the in-use vertical direction by engagement of the engaging portion in the mortise.

9. A frame or a manhole assembly according to Claim 8 wherein the pad includes a region of material that is secured to the engaging portion and protrudes from the seating member via the opening in the shoulder.

5

10. A frame or a manhole assembly according to any of Claims 7 to 9 wherein the opening in the further face of the cuboidal block is of a shape and orientation that permits insertion of the pad into the slot and its removal therefrom, in a direction other than the in-use vertical direction.

10

11. A frame or a manhole assembly according to any of Claims 7 to 10 wherein the upwardly facing shoulder is in use of the frame inclined to define respective upper and lower shoulder edges.

15

12. A frame or a manhole assembly according to Claim 11 including a pair of the seating members that are spaced from one another in the in-use horizontal direction and the upwardly facing shoulders of which are mirror images of one another whereby the upper shoulder edges define the furthest spaced apart regions of the pair of seating members.

20

13. A frame according to Claim 1 or any preceding claim depending therefrom having one or more covers resting thereon.

25

14. A frame according to Claim 11 or a manhole assembly according to Claim 2 or any preceding claim depending therefrom wherein the frame and each cover include co-operating hinge parts formed respectively on a side of the cover and a first side of the frame whereby the or each cover is hingedly secured to the frame at the first side thereof; the or each cover substantially spanning the frame from the first side to a second side opposite the first side.

15. A frame or a manhole assembly according to Claim 14 wherein the second side has secured thereat a respective pair of the seatings that are engageable by the underside of each of the covers.
- 5 16. A frame according to Claim 14 or Claim 15 that is essentially rectangular and includes a plurality of the covers arranged side by side, all of the covers being hinged on the same side of the frame whereby the covers are openable to leave free access to the recess on all the remaining sides of the frame.
- 10
17. A manhole assembly according to Claim 2 and Claim 14 or Claim 15 wherein the frame is essentially rectangular and includes a plurality of the covers arranged side by side, all of the covers being hinged on the same side of the frame whereby the covers are openable to leave free access to the recess on all the remaining sides of the frame.
- 15
18. A frame according to Claim 16 wherein the upstanding wall is rectangular when viewed in plan; and wherein each cover is rectangular, the major axis of each said cover lying perpendicular to the major axis of the rectangle defined by the upstanding wall; and the edges of adjacent said covers lying spaced from one another such that the covers are capable of overlying substantially the entire aperture defined by the recess.
- 20
19. A manhole assembly according to Claim 2 and Claim 17 wherein the upstanding wall is rectangular when viewed in plan; and wherein each cover is rectangular, the major axis of each said cover lying perpendicular to the major axis of the rectangle defined by the upstanding wall; and the edges of adjacent said covers lying spaced from one another such that the covers are capable of overlying substantially the entire aperture defined by the recess.
- 25
- 30

20. A frame according to any of Claims 13 to 16 or 18 wherein one or more said covers is substantially imperforate.
21. A manhole assembly according to any of Claims 13 to 15, 17 or 19
5 wherein one or more said covers is substantially imperforate.
22. A frame according to any of Claims 1, 3 to 16, 18 or 20 wherein one or more said covers is perforated to define a grating.
- 10 23. A manhole assembly according to any of Claims 2 to 15, 17, 19 or 21 wherein one or more said covers is perforated to define a grating.
24. A frame according to any of Claims 1, 3 to 16, 18, 20 or 22 the width of the flange of which varies from place to place about the periphery
15 of the frame.
25. A manhole assembly according to any of Claims 2 to 15, 17, 19, 21 or 23 the width of the flange of which varies from place to place about the periphery of the frame.
- 20 26. A frame according to any of Claims 1, 3 to 16, 18, 20, 22 or 24 including protrusions or recesses formed on one or more surfaces thereof that are embeddable in a bonding medium at the open, upper end of the recess, the protrusions or recesses enhancing the bonding of the frame in
25 the medium and stiffening the frame.
27. A manhole assembly according to any of Claims 2 to 15, 17, 19, 21, 23 or 25 wherein the frame includes protrusions or recesses formed on one or more surfaces thereof that are embeddable in a bonding medium at the
30 open, upper end of the recess, the protrusions or recesses enhancing the bonding of the frame in the medium and stiffening the frame.

28. A frame according to Claim 26 or a manhole assembly according to Claim 27 wherein the protrusions or recesses include an array of ribs formed on an upwardly and/or downwardly facing surface of the flange.
- 5
29. A frame or a manhole assembly according to Claim 28 wherein the ribs of the array are elongate and are mutually parallel, and all protrude by generally the same amount from the flange.
- 10 30. A frame or a manhole assembly according to Claim 29 wherein the frame is generally polygonal when viewed in plan, and wherein the elongate axis of each rib is generally parallel with a diagonal of the thus-defined polygon.
- 15 31. A frame generally as herein described, with reference to and/or as illustrated in the accompanying drawings.
32. A manhole assembly generally as herein described, with reference to and/or as illustrated in the accompanying drawings.

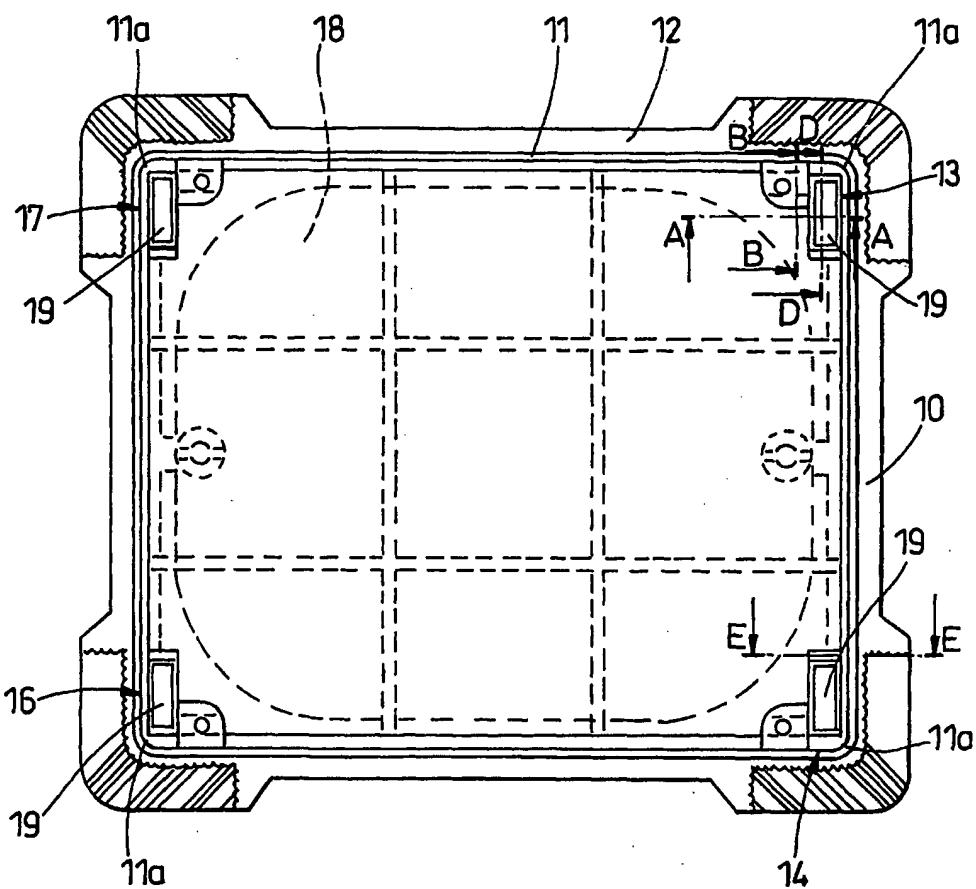


Fig. 1

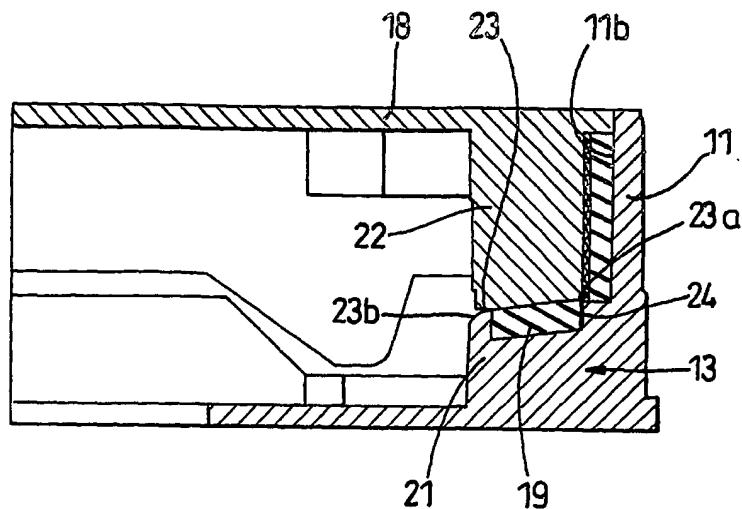


Fig. 2

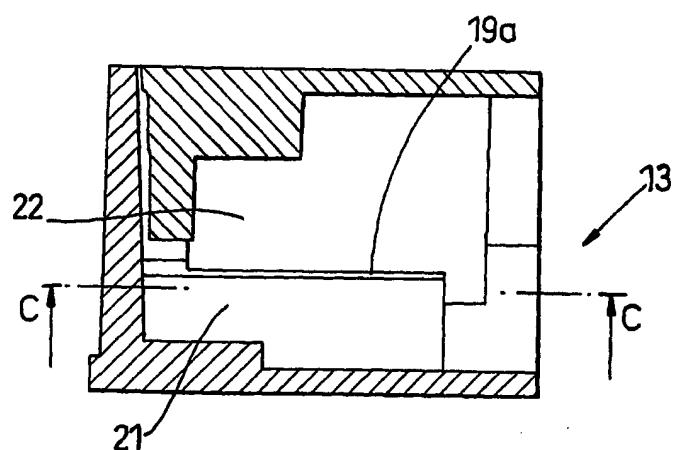


Fig. 3

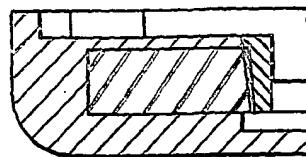


Fig. 4

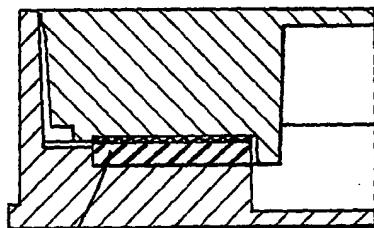


Fig. 5

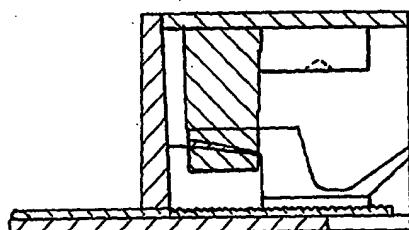


Fig. 6

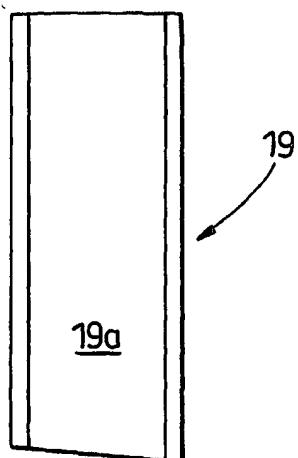


Fig. 7A

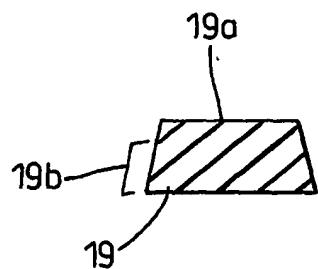


Fig. 7B

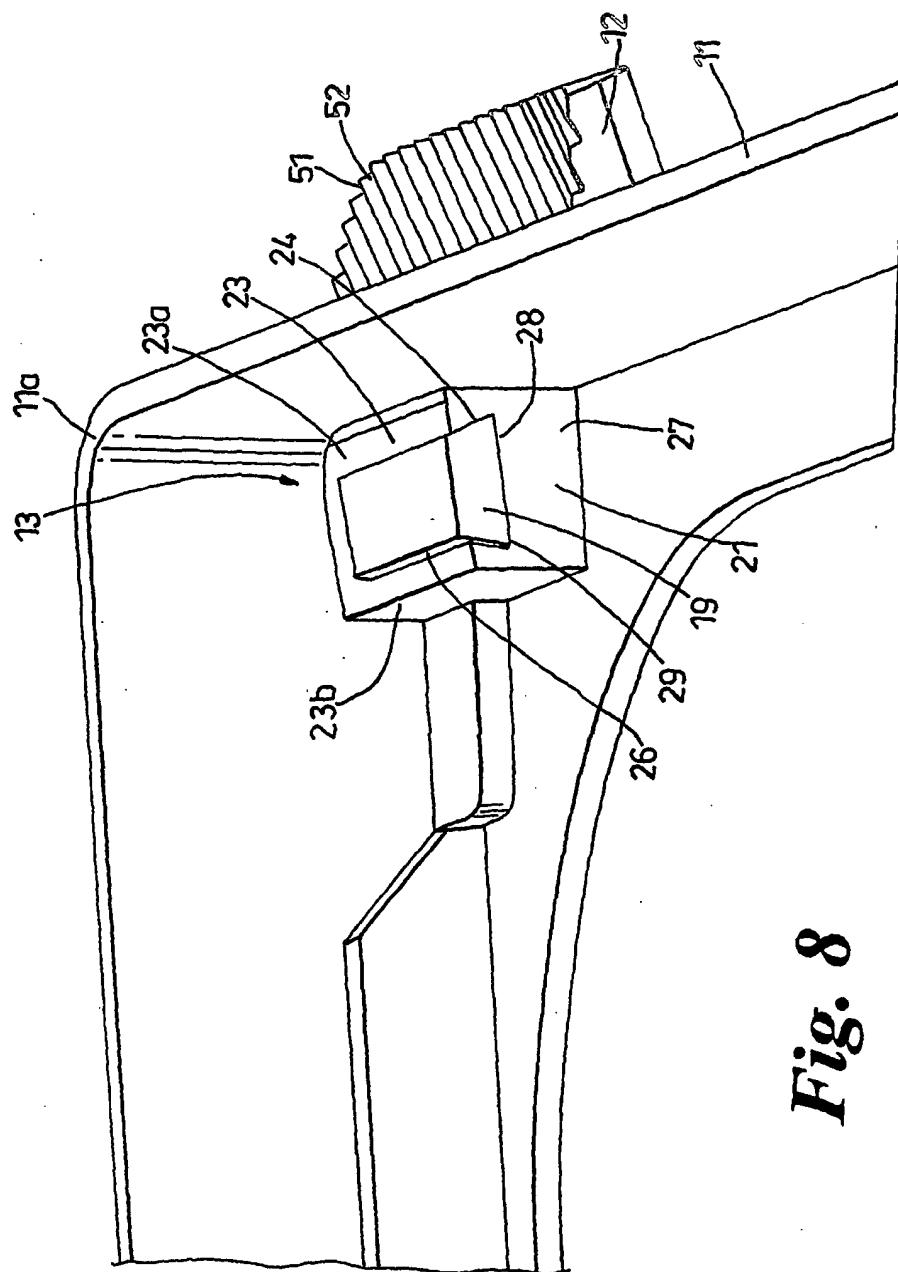
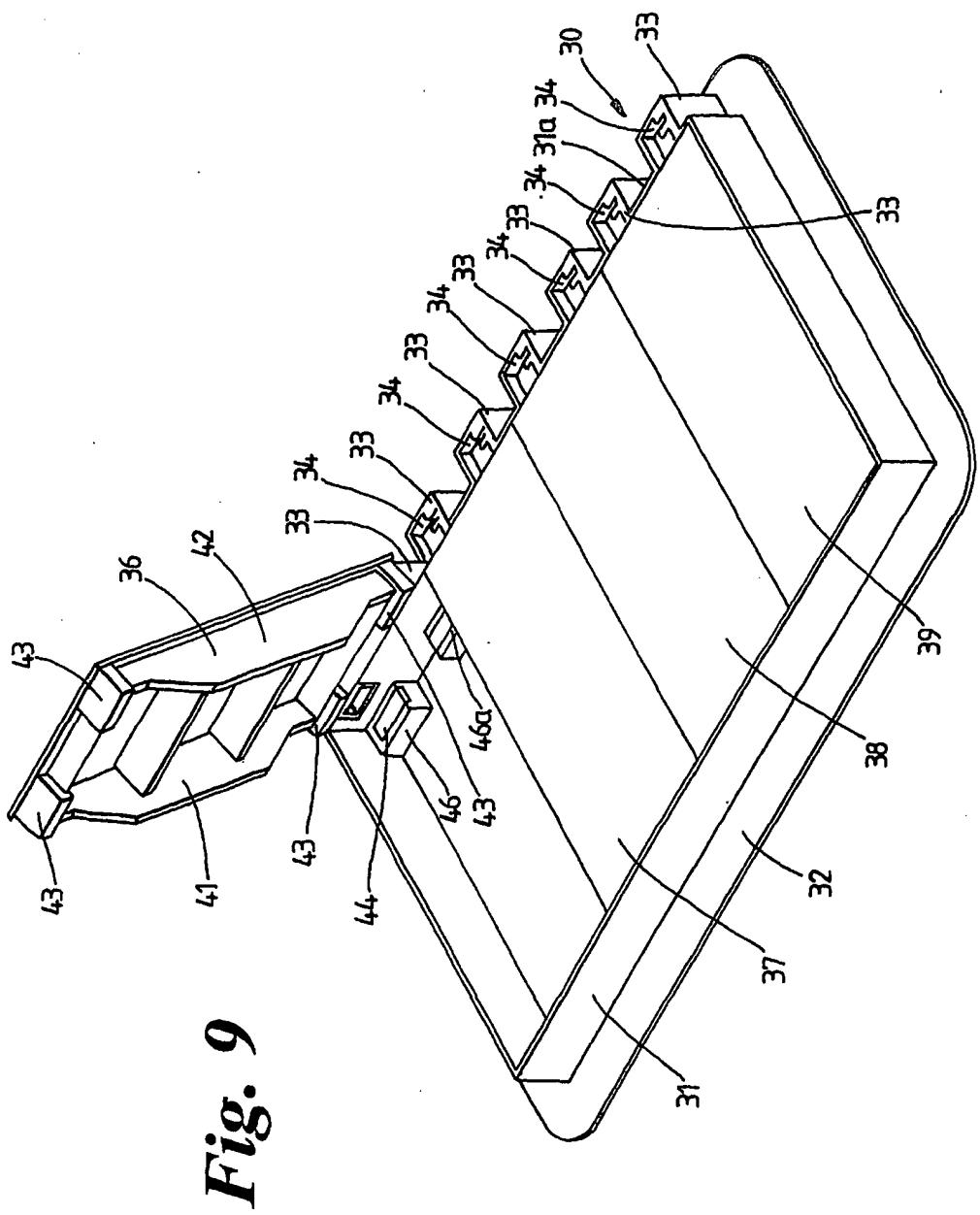


Fig. 8



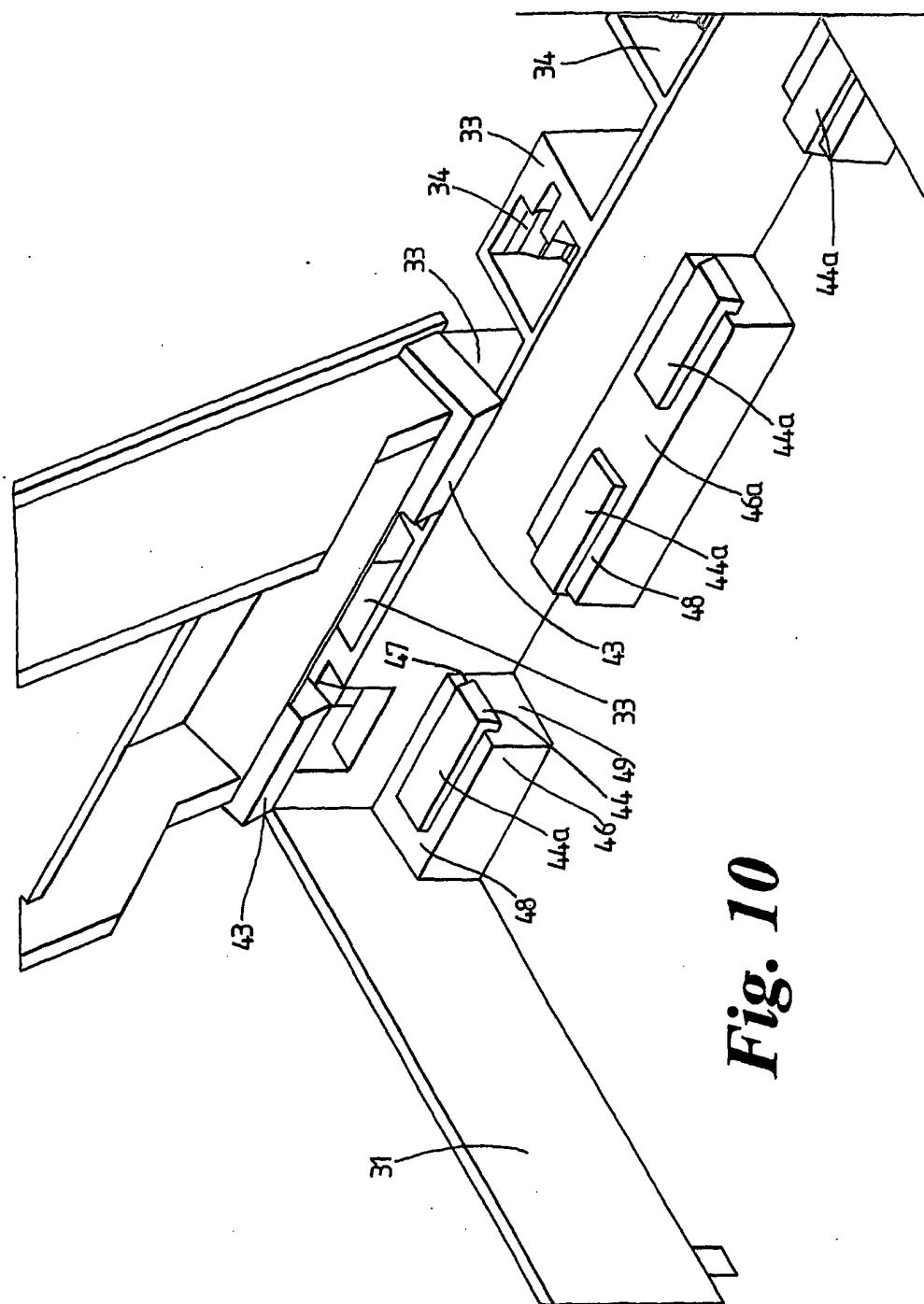


Fig. 10

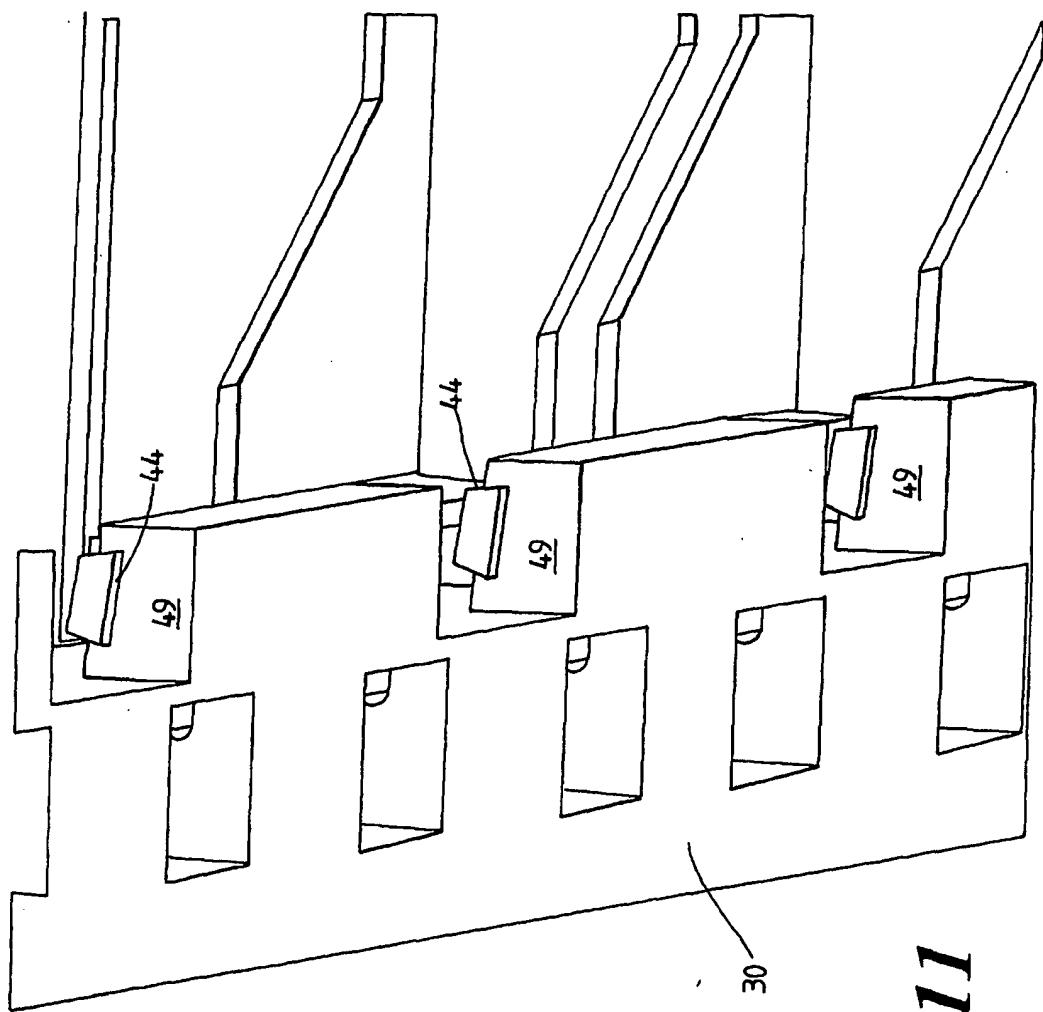


Fig. 11

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